[Sample holder]

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Claim

Sample holder for metal samples, which are to undergo a surface treatment on a grinding or polishing machine, with the following characteristics:

(a) the sample holder has the shape of a circular disk;

(b) the circular disk has recesses for mounting the metal sample to be treated;

(c) the sample holder is detachably mountable on a rotatable shaft;

characterized by the following characteristics:

(d) the sample holder has a number of cylindrical inserts (2);

(e) the inserts (2) are wedged in the disk (1);

(f) through the inserts (2), respectively, one oblong hole (14) passes;

(g) at one end, around the oblong hole (14), a number of radial grooves (15) and a number of concentric grooves (16) are arranged within a sealing ring (17), projecting from the surface;

(h) at the other end of the oblong hole (14), a vacuum connection is provided in order to tightly hold the thin metal sample (18) by means of a suction force against the grooved surface of the inserts (2).

Description

The invention relates to a sample holder for metal samples, which are to undergo a surface treatment on a grinding or polishing machine, with the following characteristics:

(a) the sample holder has the shape of a circular disk;

(b) the circular disk has recesses for mounting the metal sample to be accommodated;

(c) the sample holder is detachably mountable on a rotatable shaft.

Such sample holders are used in the steel industry, but also in other branches of industry, for example, in order to prepare the surface of rolled steel samples for a subsequent microscopic examination. With the presently available sample holders, the samples are fastened in the recesses, for example, with cement. Following this fastening, the sample holder is pressed against a rotating grinding or polishing disk. During the grinding of thin samples, for example, with a thickness of 0.25 mm or less, the sample may become heated due to the heat generated during the grinding process to temperatures which are above a certain limit.

This is undesirable and may lead to a false interpretation during later microscopic testing. Also, it is possible for the samples to fall out of the sample holder which leads to undesirable bending and folding which is disadvantageous as well.

It is the task of the invention to create a sample holder of the initially mentioned type to which the samples may be easily attached and removed again without being subjected to overheating.

In accordance with the invention, this task is solved by means of a sample holder with the following characteristics:

(d) the sample holder has a number of cylindrical inserts;

(e) the inserts are wedged into the disk;

(f) through the inserts, respectively, one oblong hole passes;

(g) at one end, around the oblong hole, a number of radial grooves and a number of concentric grooves are arranged within a sealing ring, projecting from the surface;

(h) at the other end of the oblong hole, a vacuum connection is provided in order to hold the thin metal sample, by means of suction force, tightly against the grooved surface of the inserts.

An embodiment example of the invention is shown in the drawing, wherein

Figure 1 shows a top view of a sample holder at a reduced scale;

Figure 2 shows a side view of the sample holder in accordance with Figure 1;

Figure 3 shows a view of the sample holder from below in accordance with the Figures 1 and 2;

Figure 4 shows a cross section through one of the inserts an enlarged scale;

Figure 5 shows an even more greatly enlarged cross section of the vacuum guide of the sample holder according to Figures 1 to 4.

The circular disk (1), shown in the Figures 1, 2 and 3, consists of stainless steel and is provided with six cylindrical inserts (2) made of brass. In order to be able to tightly wedge these inserts (2) into the circular disk (1), incisions (3) cut with a saw and locking screws (4) are provided.

On the upper surface of each insert (2), connection nipples (5) are arranged which are connected by means of a hose or tube connection (6) with a double nipple (7) which is part of a vacuum guide block (9), fastened onto a base plate (8). To this vacuum guide block (9), a vacuum tube (10) is connected.

The vacuum guide block (9) serves simultaneously also as a means for detachably fastening the entire sample holder to a rotatable shaft, not shown here in greater detail, of a grinding and polishing machine. For this purpose, it is provided with a snap-on head (11). At its surface, three coupling holes (12) are

provided into which extend supporting bolts of the above-mentioned machine, which are not shown here in greater detail.

The base plate (8) is fastened to the circular disk (1) by means of fixing screws (13).

Figure 4 shows an insert (2) in cross section on an enlarged scale. It has an oblong hole (14), whose upper end is provided with a connection nipple (5). On the underside, the insert (2) has, for example, four radial grooves (15) and ten concentric grooves (16). These are surrounded by a rubber sealing ring (17) which lies in a deep groove and practically completely fills it up and has, for example, a width of 1.6 mm and a depth of 3.8 mm. Figure 4 shows that a thin, disk-shaped sample (18) of rolled steel rests against the rubber sealing ring (17) with the burr originated by the punching unit.

In order to insure that the suction effect of the vacuum applied by means of the vacuum tube (10) affects the six samples (18) while the entire sample holder is being turned, an integral vacuum guide block (9) is provided, as shown on an enlarged scale in Figure 5.

With the vacuum tube (9), a barrel ring (19) is connected which, like the vacuum tube (10), is stationary. The barrel ring (19) has on one inner surface an annular groove (19A) which is connected by means of a number of radial boreholes (26) with a central borehole (27) in the lower section (9B) of the vacuum guide block (9). The central borehole (27) is closed off completely airtight at its underside by means of a plug (24). On three sides, radial boreholes (25) are connected with the double nipples (7) which are screwed on at the lower part (9b).

Furthermore, in this lower part, three blind holes (22) are provided by means of which the coupling to the base plate (8) is

effected. The upper portion (9A) of the vacuum guide block (9) is screwed together with the lower part (9B), so that the two parts can turn freely about the barrel ring (19), wherein a locking screw (23) prevents the two parts (9A, 9B) from turning independently of each other.

In the barrel ring (19), two O-rings (20) are provided which seal off both parts of the vacuum guide block (9). Furthermore, at the upper and lower surfaces of the barrel ring (19), concentric labyrinth grooves (21) are formed for the same purpose.

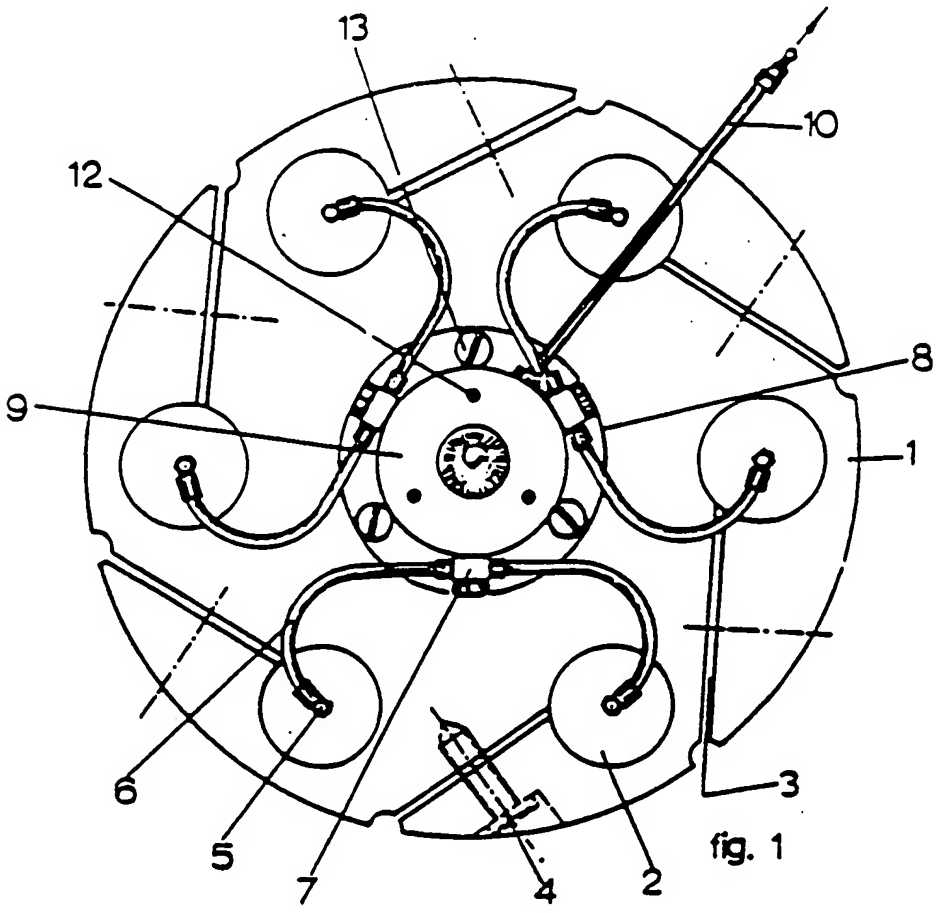

fig. 1

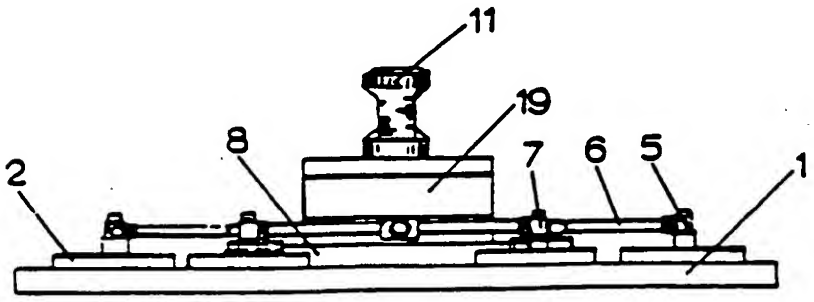

fig. 2

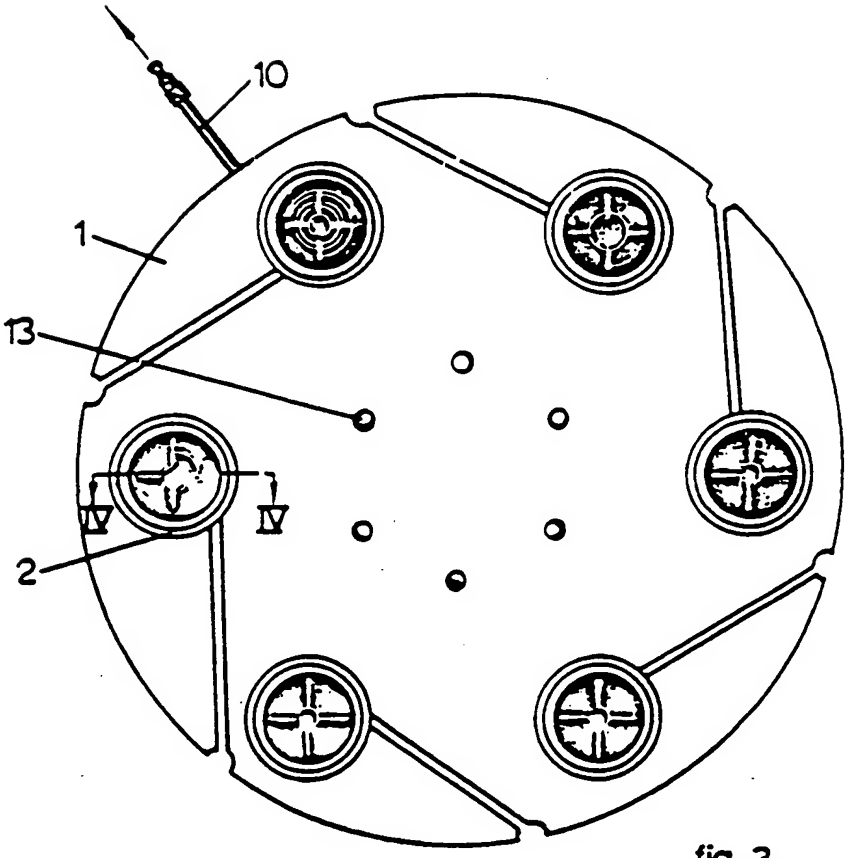

fig. 3

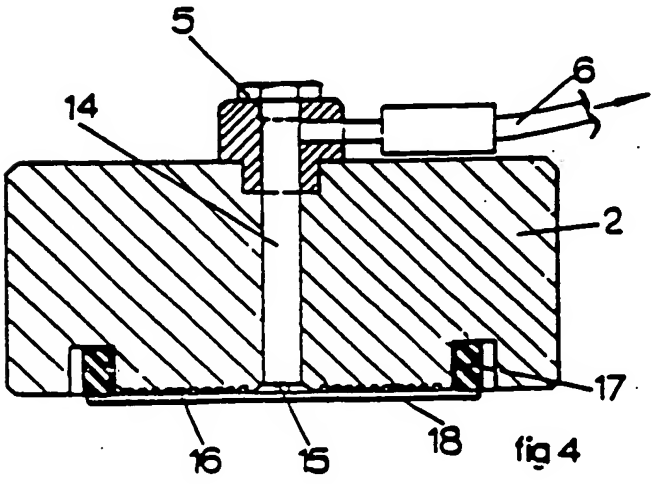

fig. 4

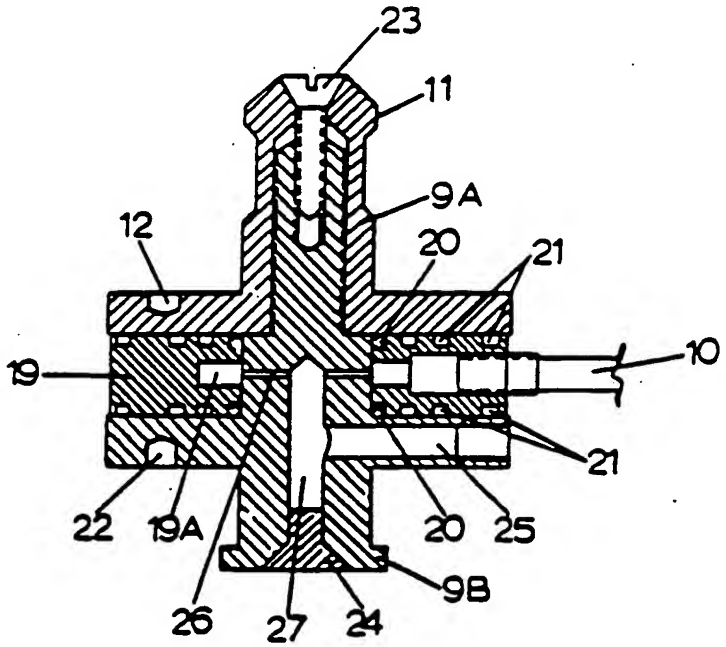

fig. 5

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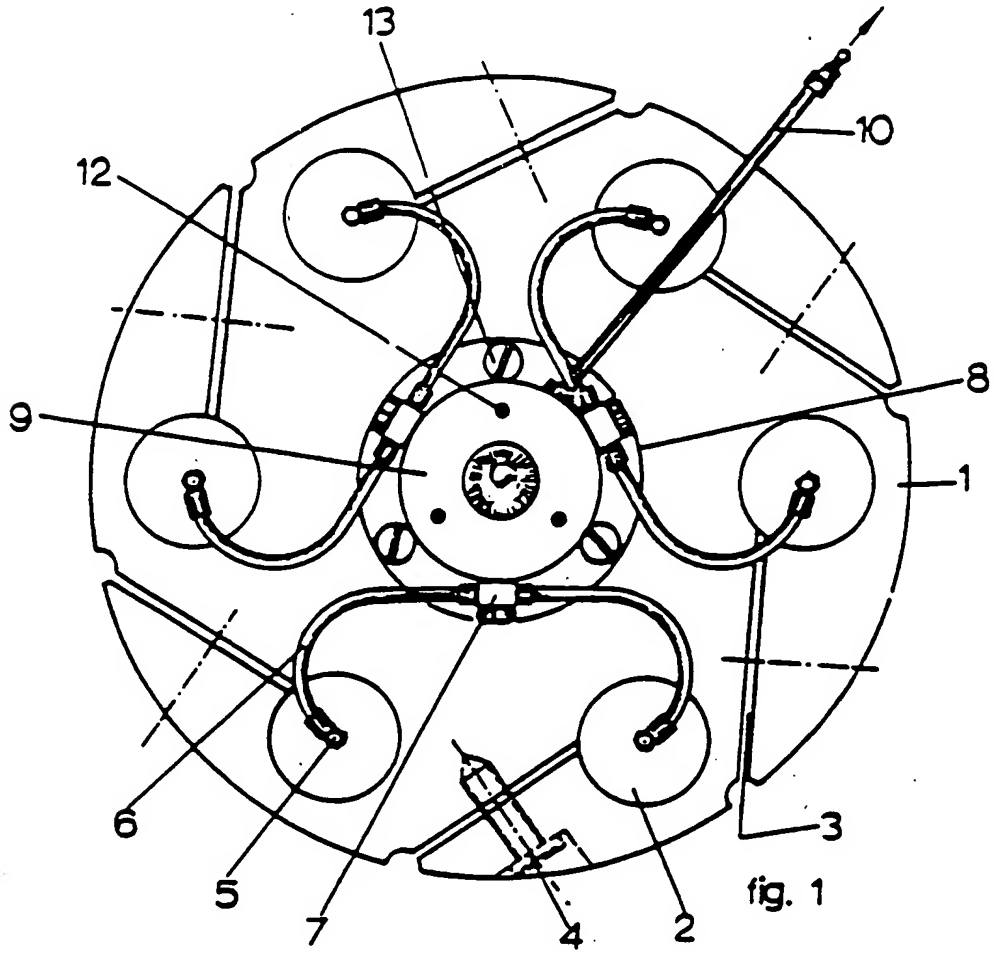

fig. 1

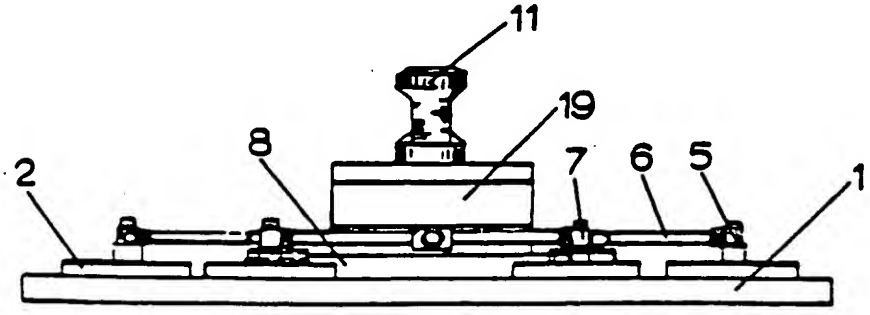

fig. 2

Anspruch:

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Probenhalter

Probenhalter für Metallproben, die einer Oberflächenbehandlung auf einer Schleif- oder Poliermaschine zu unterziehen sind, mit folgenden Merkmalen:

(a) der Probenhalter hat die Form einer Kreisscheibe;

(b) die Kreisscheibe hat Ausnehmungen zur Aufnahme der zu behandelnden Metallprobe;

(c) der Probenhalter ist lösbar an einer drehbaren Welle befestigbar;

gekennzeichnet durch folgende Merkmale:

(d) der Probenhalter hat eine Anzahl von zylindrischen Einsatzkörpern (2);

(e) die Einsatzkörper (2) sind in der Scheibe (1) eingeklemmt;

(f) durch die Einsatzkörper (2) geht jeweils ein Längsloch (14);

(g) an einem Ende sind um das Längsloch (14) eine Anzahl von Radialnuten (15) und eine Anzahl von konzentrischen Nuten (16) innerhalb eines von der

Oberfläche vorstehenden Dichtrings (17) angeordnet;

(h) am anderen Ende des Längslochs (14) ist eine Vakuumverbindung vorgesehen, um die dünne Metallprobe (18) mittels Saugkraft fest gegen die genutete Oberfläche der Einsatzkörper (2) zu halten.

Beschreibung:

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Probenhalter

Die Erfindung bezieht sich auf einen Probenhalter für Metallproben, die einer Oberflächenbehandlung auf einer Schleif- oder Poliermaschine zu unterziehen sind, mit folgenden Merkmalen:

(a) der Probenhalter hat die Form einer Kreisscheibe;

(b) die Kreisscheibe hat Ausnehmungen zur Aufnahme der zu behandelnden Metallprobe;

(c) der Probenhalter ist lösbar an einer drehbaren Welle befestigbar.

Solche Probenhalter werden in der Stahlindustrie, aber auch in anderen Industriezweigen benutzt, um beispielsweise die Oberfläche von gerollten Stahlproben für eine nachfolgende mikroskopische Prüfung zu präparieren. Bei den derzeit lieferbaren Probenhaltern werden die Proben in den Ausnehmungen beispielsweise mit Zement befestigt. Nach dieser Befestigung wird der Probenhalter gegen eine rotierende Schleif- oder Polierscheibe gepreßt. Beim Schleifen von dünnen Proben, beispielsweise mit einer Dicke von 0,25 mm oder weniger, kann sich die Probe aufgrund der bei dem Schleifvorgang entstehenden Hitze auf Temperaturen erwärmen, die oberhalb einer bestimmten Grenze liegt. Dies ist unerwünscht und kann zu einer falschen Interpretation bei

der späteren Mikroskopprüfung führen. Auch können die Proben aus dem Probenhalter herausfallen, was zu unerwünschten Verbiegungen und Faltungen führt, was ebenfalls nachteilig ist.

Der Erfindung liegt die Aufgabe zugrunde, einen Probenhalter der eingangs genannten Art zu schaffen, an dem die Proben leicht befestigt und wieder entfernt werden können und keiner Überhitzung unterliegen.

Diese Aufgabe wird erfindungsgemäß durch einen Probenhalter mit folgenden Merkmalen gelöst:

(d) der Probenhalter hat eine Anzahl von zylindrischen Einsatzkörpern;

(e) die Einsatzkörper sind in der Scheibe eingeklemmt;

(f) durch die Einsatzkörper geht jeweils ein Längsloch;

(g) an einem Ende sind um das Längsloch eine Anzahl von Radialnuten und eine Anzahl von konzentrischen Nuten innerhalb eines von der Oberfläche vorstehenden Dichtrings angeordnet;

(h) am anderen Ende des Längslochs ist eine Vakuumverbindung vorgesehen, um die dünne Metallprobe mittels Saugkraft fest gegen die genutete Oberfläche der Einsatzkörper zu halten.

Ein Ausführungsbeispiel der Erfindung ist in der Zeichnung dargestellt. Es zeigen:

Figur (1) eine Draufsicht auf einen Probenhalter in

verkleinertem Maßstab;

Figur (2) eine Seitenansicht des Probenhalters gemäß Figur (1);

Figur (3) eine Ansicht des Probenhalters gemäß den Figuren (1) und (2) von unten;

Figur (4) einen Querschnitt durch einen der Einsatzkörper in vergrößertem Maßstab;

Figur (5) einen noch weiter vergrößerten Querschnitt der Vakuumführung des Probenhalters nach den Figuren (1) bis (4).

Die in den Figuren (1), (2) und (3) dargestellte Kreisscheibe (1) besteht aus rostfreiem Stahl und ist mit sechs zylindrischen Einsatzkörpern (2) aus Messing versehen. Um diese Einsatzkörper (2) in der Kreisscheibe (1) festklemmen zu können, sind eingesägte Einschnitte (3) und Klemmschrauben (4) vorgesehen.

Auf der Oberseite jedes Einsatzkörpers (2) sind Verbindungsnippel (5) angeordnet, die über eine Schlauch- oder Rohrverbindung (6) mit einem Doppelnippel (7) verbunden sind, das Teil eines auf einer Grundplatte (8) befestigten Vakuumführungsblocks (9) ist. An diesem Vakuumführungsblock (9) ist ein Vakuumrohr (10) befestigt.

Der Vakuumführungsblock (9) dient gleichzeitig auch als lösbare Befestigung des gesamten Probenhalters an einer hier nicht näher dargestellten drehbaren Welle einer Schleif- und Poliermaschine. Hierfür ist er mit einem

Schnappverschlußkopf (11) ausgestattet. An seiner Oberfläche sind drei Kupplungslöcher (12) vorgesehen, in die hinein sich hier nicht näher dargestellte Trägerbolzen der vorgenannten Maschine erstrecken.

Die Grundplatte (8) ist an der Kreisscheibe (1) mittels Fixierschrauben (13) befestigt.

Figur (4) zeigt einen der Einsatzkörper (2) in einem Querschnitt in vergrößertem Maßstab. Er weist ein Längsloch (14) auf, dessen oberes Ende mit einem Verbindungsnippel (5) versehen ist. Auf der Unterseite weist der Einsatzkörper (2) beispielsweise vier Radialnuten (15) und zehn konzentrische Nuten (16) auf. Diese werden von einem Gummidichtring (17) umgeben, der in einer tiefen Nut liegt und diese praktisch vollständig ausfüllt und dabei beispielsweise eine Breite von 1,6 mm und eine Tiefe von 3,8 mm hat. Figur (4) zeigt, daß eine dünne, scheibenförmige Probe (18) aus Walzstahl am Gummidichtring (17) mit dem durch das Stanzen entstandenen Grat anliegt.

Damit gesichert ist, daß der Saugeffekt des über das Vakuumrohr (10) aufgeprägten Vakuums auf die sechs Proben (18) wirkt, während der gesamte Probenhalter gedreht wird, ist ein integraler Vakuumführungsblock (9) vorgesehen, wie er in vergrößertem Maßstab in Figur (5) dargestellt ist.

Mit dem Vakuumrohr (9) ist ein Laufring (19) verbunden, der ebenso wie das Vakuumrohr (10) stationär ist. Der Laufring (19) hat an einer Innenseite eine Ringnut (19A), die über eine Anzahl von Radialbohrungen (26) mit einer Zentralbohrung (27) im unteren Teil (98) des

Vakuumführungsblocks (9) verbunden ist. Die Zentralbohrung (27) ist vollständig luftdicht an ihrer Unterseite durch einen Stopfen (24) verschlossen. Auf drei Seiten sind Radialbohrungen (25) mit den Doppelnippeln (7) verbunden, die am unteren Teil (9b) angeschraubt sind.

In diesem unteren Teil sind des weiteren drei Blindlöcher (22) vorgesehen, durch die das Kuppeln zur Grundplatte (8) bewirkt wird. Der obere Teil (9A) des Vakuumführungsblocks (9) ist mit dem unteren Teil (9B) verschraubt, so daß die beiden Teile frei um den Laufring (19) drehen können, wobei eine Sicherungsschraube (23) verhindert, daß sich die beiden Teile (9A, 9B) unabhängig voneinander verdrehen.

Im Laufring (19) sind zwei O-Ringe (20) vorgesehen, die beide Teile des Vakuumführungsblocks (9) abdichten. Ferner sind an den Ober- und Unterflächen des Laufring (19) konzentrische Labyrinthnuten (21) für den gleichen Zweck eingeformt.

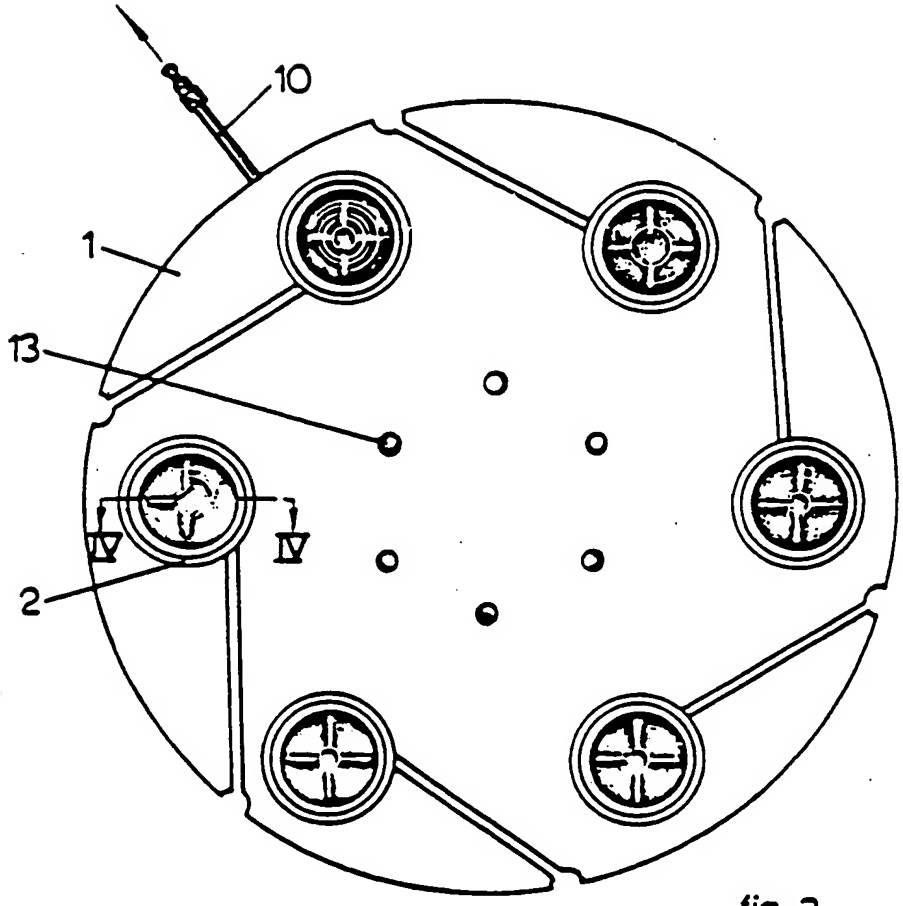

fig. 3

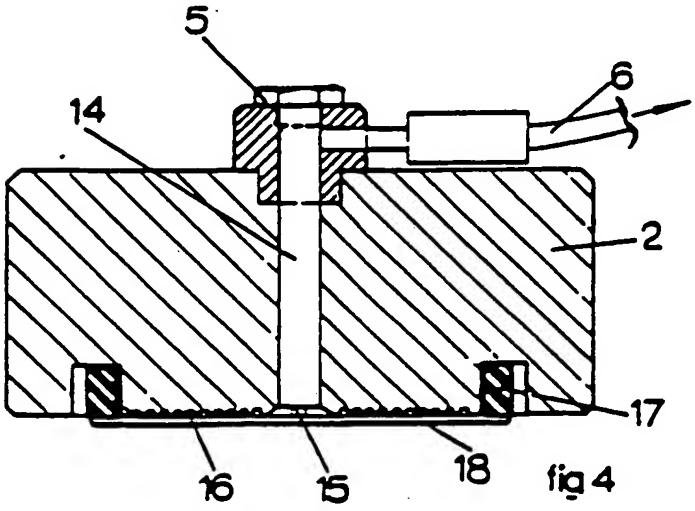

fig 4

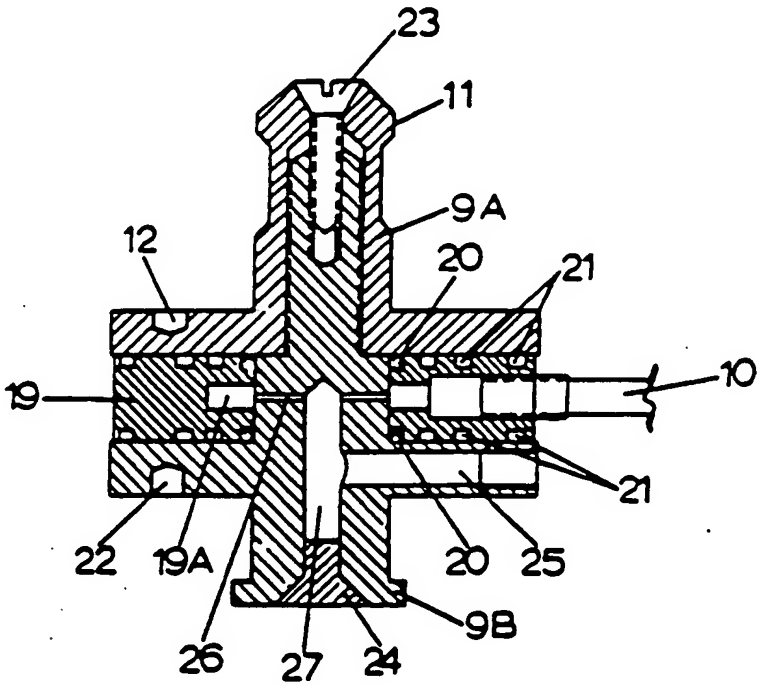

fig.5

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WORKPIECE HOLDING MECHANISM FOR A PLANE POLISHING DEVICE

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[There are no amendments to this patent.]

Claim

1. A workpiece holding mechanism for a plane polishing device characterized in that it contains a holding part, which holds a workpiece that is on top of the polishing surface of the plane polishing device and is equipped with a convex spherical surface centering around one point on the surface of the said workpiece to be processed; a support part, which is provided for maintaining a constant orientation and is equipped with a concave spherical surface, which engages with the aforementioned convex spherical surface in a freely oscillating manner centering about one point on the aforementioned workpiece; and a flexible body, which is provided between the aforementioned holding part and the aforementioned supporting part and has high torsional rigidity but can bend freely.

Detailed explanation of the invention

Industrial application field

The present invention concerns a workpiece holding mechanism for a plane polishing device. In particular, it concerns a holding mechanism for a workpiece in a plane polishing device which polishes the surface of thin plates.

Prior art

Generally, a workpiece holding mechanism for a plane polishing device is constructed to include a holding area, where the workpiece is held on top of a polishing surface of the plane polishing device, and the surface of the workpiece is polished by oscillating [vibrating while moving] the workpiece over the polishing surface.

Figure 2 is a longitudinal section of a workpiece holding mechanism for a plane polishing device of the prior art. In Figure 2, a disk (1) of the plane polishing device is rotated about a shaft (2). Also, a sleeve (4) is attached to a frame (3) of the plane polishing device in a freely rotatable manner, and a splined shaft (5) is attached to the central hole of this sleeve (4) in a freely movable manner in the direction of the shaft and in such a manner that it rotates together with the sleeve (4) about the shaft. A lever (7), which is attached to an air cylinder (6) provided for the frame (3), engages with the splined shaft (5) in a freely rotatable manner. Also, a gear (9), which is attached to a motor (8) provided for the frame (3), engages with a gear (10), which is provided at the sleeve (4).

A hemispherical body (11) engages with the curved area in the form of a spherical surface that is provided at the front end of the splined shaft (5) in a freely oscillating manner. A pressing plate (12) is fixed to the hemispherical body (11), and a frame (13) is provided at the pressing plate (12). A pin (14), which is provided at the frame (13), engages with a groove (15), which is provided at the front end of the splined shaft (5). A compression spring (16), which is provided between the splined shaft (5) and the frame (13), interacts to press the hemispherical body (11) onto the splined shaft (5) in order to prevent the hemispherical body (11) from falling when the splined shaft (5) ascends.

A through-hole (17), which is provided at the pressing plate (12), and a through-hole (18), which is provided between the hemispherical body (11) and the pressing plate (12), are connected to a vacuum pump (not shown) through a pipe (19), which passes through a hole provided at the splined shaft (31), in order to vacuum hold material (20), which is a magnetic disk forming the workpiece, onto the pressing plate (12). A ring (21) is also provided and fixed at the pressing plate (12) in order to determine the position of the material (20).

To polish the surface of the material (20) with this plane polishing device, the air cylinder (6) is actuated so that the pressing plate (12) ascends and so that the material (20) is vacuum held against the inner side of the ring (21) at the lower surface of the pressing plate (12). Next, the pressing plate (12) is lowered by the air cylinder (6) through rotation of the motor (8), and the material (20) is pressed against the polishing surface (22) of the disk (1). Also, a polishing solution (not shown) is spread over the polishing surface (22). Accordingly,

the bottom surface of the material (20) is polished by the action of its own rotations and vibrations by the rotation of the disk (1).

The polishing surface (22) of the disk (1) is processed to have a flat surface; however, a small amount of waviness remains in many actual cases. Accordingly, it is necessary for the material (20) and the pressing plate (12) to be able to tilt slightly along the waviness of the polishing surface (22) in order for the material (20) constantly to adhere close to the polishing surface (22) for a smooth finish. This tilting is obtained when the hemispherical body (11) vibrates with the spherical concave area of the splined shaft (5). Moreover, the material (20) tilts while centering around the center C because the center C of the spherical surface of the hemispherical body (11) is established to be positioned at the bottom surface of the material (20), and the position of the bottom surface of the material (20) does not change even though it is tilted, and polishing can occur.

The pipe (19) is elastic and can absorb some tilting in the hemispherical body (11). Also, the hemispherical body (11) vibrates around the splined shaft (5); therefore, it is designed so that the rotation by the motor (8) is transmitted to the pressing plate (12) and the material (20) when the pin (14) engages with the groove (15).

Problems to be solved by the invention

However, the ability of the pressing plate (12) and material (20) to follow the waviness of the polishing surface (22) was not satisfactory. One factor is the generation of a large amount of

friction between the pin (14) and the groove (15). Figure 3 is a schematic diagram explaining the force that is applied to the pin (14), and it corresponds to the right side surface diagram of the major part in Figure 2. In Figure 3, force b, which is equal to the friction between the material (20) and the polishing surface (22), is applied to the groove (15) from the pin (14) when the splined shaft (5) rotates, as illustrated by arrow a. Furthermore, since a condition is created, in which the right side opens between the material (20) and the polishing surface (22), as illustrated in Figure 1, by the waviness of the polishing surface (22), and if force P is obtained by the piston (6), force P interacts upwards at the left edge of the material (20). To consider the equilibrium of the moment about center C, where the length between center C of the spherical surface of the hemispherical body (11) and the left edge of the material (20) is d and the height between center C and the pin (14) is h, a force of Pd/h is also applied to the pin (14). In practice, this force P becomes considerably large; therefore, a large force also acts on the pin (14), resulting in a large frictional force.

There was also the problem of the pin (14) being constantly pressed toward the left by the groove (15) in Figure 3, causing the pressing plate (12) to swing around the pin (14) according to the waviness of the polishing surface (22), the base ([illegible]) of the pin (14) to change its position to the left or the right relative to the splined shaft (5), and a fluctuation to occur in the rotation of the pressing plate (12).

The aim of the present invention is to offer a workpiece holding mechanism for a plane polishing device in which the aforementioned problems are solved, there is a satisfactory following of the waviness of the polishing surface by tilting of

the workpiece, and the fluctuation in the rotation of the workpiece is reduced for a smooth polishing of the workpiece.

Means to solve the problems

The present invention comprises a holding part (34), which holds the workpiece that is on top of the polishing surface of the plane polishing device and is equipped with a convex spherical surface centering around one point on the surface of the said workpiece to be processed; a support part (32), which is provided for maintaining a constant orientation and is equipped with a concave spherical surface, which engages with the aforementioned convex spherical face in a freely vibrating manner centering about one point on the aforementioned workpiece; and a flexible body (36), which is provided between the aforementioned holding part (34) and the aforementioned support part (32) and has high torsion rigidity but can bend freely.

Function

The elastic body (36), which has torsional rigidity but can bend freely, tilts the holding part (34) against the support part (32) while following the waviness of the polishing surface and not generating a large amount of friction. During this process, the holding part (34) does not separate from the support part (32) in the direction of rotation.

Application example

Next, an application example of the present invention will be explained with reference to a figure. Figure 3 [sic; 1] is a longitudinal section of an application example of the present invention. A disk (1), shaft (2), frame (3), sleeve (4), air cylinder (6), lever (7), motor (8), and gears (9) and (10) are the same as those illustrated in Figure 1 [sic; 2]. A splined shaft (31) is attached to the sleeve (4) so that it can freely oscillate in the direction of the shaft and rotate together with it around the shaft. A hemispherical body (33) engages with the concave part in the form of a spherical surface, which is provided at a flange (32) at the lower end of the splined shaft (31) in a freely oscillating manner. A pressing plate (34) is fixed to the hemispherical body (33). A through-hole (35) of the pressing plate (34) is connected to a pipe (19) in order to hold the material (20) against the pressing plate (34).

The upper end of bellows (36) is fixed to the flange (32) and its lower end to the pressing plate (34). The torsional rigidity of the bellows (36) with respect to the central shaft is high, but it can expand and bend in the direction of the central shaft; therefore, the pressing plate (34) does not separate from the flange (32) in the direction of rotation, but it can tilt freely. Accordingly, a large frictional force is not generated even when the pressing plate (34) is tilted, and the pressing plate (12) and the material (20) satisfactorily follow the waviness of the polishing surface.

The present invention can also be applied to plane polishing devices, in which the disk is fixed, and the pressing plate (34),

for example, rotates together with the frame (3) around the shaft (12).

A steel ball, for example, may also be included between the concave spherical surface of the supporting part and the convex spherical surface of the holding part so that the friction can be reduced.

Furthermore, the elastic body that is provided between the support part and the holding part does not necessarily have the form of a bellows. For example, dividing the bellows in the circumferential direction, in other words, several plate springs that are bent in the middle and arranged over the circumference may also be used.

Effect of the invention

As explained above, in the workpiece holding mechanism for a plane polishing device of the present invention, the holding part is tilted without the generation of a large amount of friction between the groove and the pin by using an elastic body which has torsional rigidity but which can expand and bend freely, instead of an engagement between the groove and the pin, and the workpiece can satisfactorily tilt with and follow the waviness of the polishing surface.

Also, oscillations around the pin are eliminated when the support part is tilted, a fluctuation in the rotating speed of the workpiece can be made very small, and the effect is smooth polishing of the workpiece.

Brief description of the figures

Figure 1 is a longitudinal section of an application example of the present invention. Figure 2 is a longitudinal section of an example of a workpiece holding mechanism for a plane polishing device of the prior art. Figure 3 is a model diagram which explains the force which interacts on the pin (14) as an example illustrated in Figure 2.

1···disk, 5, 31···splined shaft, 11, 33···hemispherical body, 12, 34···pressing plate, 14···pin, 15···groove, 20···material, and 36···bellows.

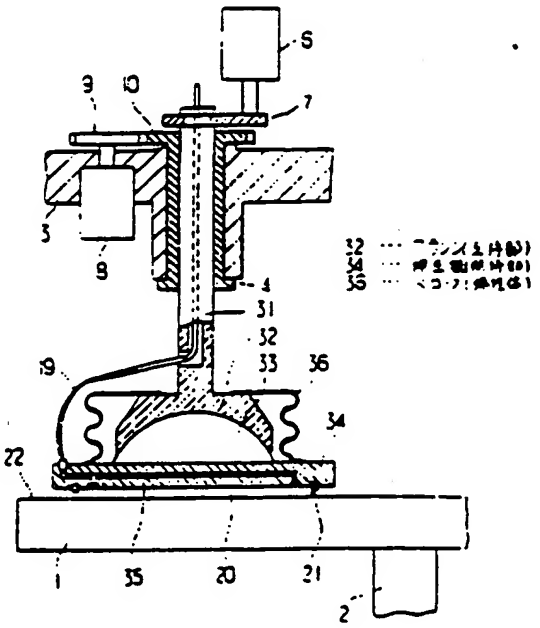

Figure 1

Key: 32 Flange (supporting part)
34 Pressing plate (holding part)
36 Bellows (elastic body)

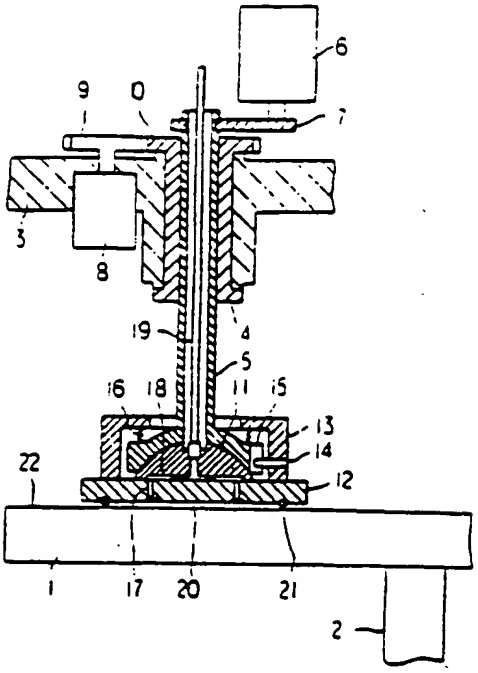

Figure 2

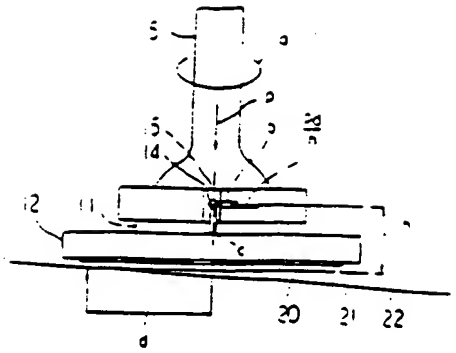

Figure 3

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UBLICATION NUMBER : JP61025768
UBLICATION DATE : 04-02-86
PPLICATION NUMBER : JP840145408
PPLICATION DATE : 13-07-84

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ATENTEE : NEC CORP
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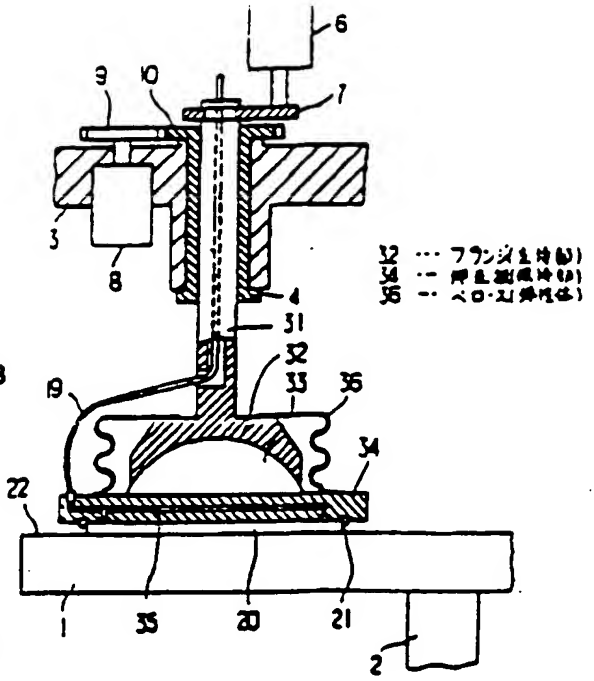
INVENTOR : KAMATA TAKEMI; others: 01

INT.CL. : B24B37/04; B24B7/16; B24B41/06

TITLE : WORK HOLDING MECHANISM FOR SURFACE POLISHING MACHINE



ABSTRACT : PURPOSE:To polish a work smoothly by providing a resilient bellows between the work holding section having convex face and the supporting member having concave face engagable slidably with the convex face.
CONSTITUTION:Semi-spherical body 33 secured to a pressboard 34 i engaged slidably with spherical recess made in the lower end flange 32 of spline shaft 31 to adsorb a material 20 through a hole 35 communicated with a tube 19 to the pressboard 34. A bellows 36 having high rigidity in the rotary direction while flexible against the vertical shrinkage and bending is secured between said flange 32 and the pressboard 34. Consequently, the work 20 or the pressboard 34 will follow the waving of the polishing face 22 well to reduce the fluctuation of the rotary speed of the work 20 thus to polish the work 20 smoothly.

⑲日本国特許庁（JP）　　⑪特許出願公開
⑫公開特許公報（A）　　昭61－25768

⑤Int.Cl.⁴	識別記号	庁内整理番号	㊸公開 昭和61年(1986) 2月4日
B 24 B 37/04		7712－3C	
7/16		7512－3C	
41/06		8308－3C	審査請求 未請求 発明の数 1 （全4頁）

⑤発明の名称　平面研磨装置の被加工物保持機構

㉑特　願　昭59－145408
㉒出　願　昭59(1984) 7月13日

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明　細　書

1.発明の名称

平面研磨装置の被加工物保持機構

2.特許請求の範囲

(1)平面研磨装置の研磨盤上の被加工物を保持しこの被加工物の被加工面上の一点を中心とする凸球面を有する保持部と、[illegible]を一定に保つて設けられ前記被加工物上の一点を中心とし前記凸球面に摺動自在に係合する凹球面を有する支持部と、前記保持部と前記支持部の間に設けられ曲りに対しては剛性が大きくねじれに対しては柔軟な特性とを有することを特徴とする平面研磨装置の被加工物保持機構。

3.発明の詳細な説明

（産業上の利用分野）

本発明は、平面研磨装置の被加工物保持機構、特に薄板の表面を研磨するための平面研磨装置の被加工物保持機構に関する。

（従来技術）

一般に平面研磨装置の被加工物保持機構は、平面研磨装置の研磨盤上の被加工物を保持する保持部を含んで構成され、研磨盤上において被加工物を摺動させて被加工物の表面を研磨している。

第2図は、従来の平面研磨装置の被加工物保持機構の縦断面図である。第2図において平面研磨装置の円盤1は軸2を中心として回転させられる。一方平面研磨装置のフレーム3にはアーム4が[illegible]に取り付けられ、このアーム4の先端にはスピンドル軸5が鉛直方向に[illegible]アーム4と一体となって回転するように取り付けられている。フレーム3に設けられた[illegible]に取り付けられた[illegible]はスピンドル軸5に回転自在に係合している。[illegible]に設けた[illegible]9に取り付けた[illegible]に設けた歯車10と噛み合っている。

スピンドル軸5の先端に設けた[illegible]部に平板部11が回動自在に係合している。平板部11に円筒部12が固着され、円筒部12には、軸13が設けられている。軸13に設けられたピン14は、スピンドル軸5の先端部に設けた溝15に係合している。

スプライン軸5と座13の間に設けられた圧縮ばね16は弾性体11をスプライン軸5に押し付けるように作用し、スリーブ軸5が上昇したときに弾性体11が落下するのを防止している。

押圧板12に設けられた通気孔17及び弾性体11と押圧板12の間に設けられた通気孔18は、スプライン軸31に設けた穴を通る管19を介して真空ポンプ（図示省略）に連結され、被加工物である磁気ディスクの素材20を押圧板12に真空吸着するためのものである。また素材20の位置を決めるために押圧板12にリング21が固設されている。

この平面研磨装置で素材20の表面を研磨するには、エアシリンダ6を作動させて押圧板12を上昇させ、素材20を押圧板12の下面のリング21の内側に真空吸着させる。次にモータ8により回転させながら押圧板12をエアシリンダ6により下降させ素材20を円盤1の研磨面22に押し付ける。また図には示していないが研磨面22には、研磨液が供給されている。従つて素材20の下面は、自からの回転及び円盤1の回転による運動で研磨される。

円盤1の研磨面22は、平面にきちんと仕上げられているが常時には僅かであるがうねりが残されている場合が多い。従つて素材20を研磨面22に密に密着させて平らかに研磨するには、素材20及び押圧板12を研磨面22のうねりに従つて多少傾くことができるようにする必要がある。この傾きは、弾性体11のスプライン軸5の球状の凸部との摺動で得られ、しかも弾性体11の球面の中心Cが素材20の下面に位置するように設定されているので素材20は中心Cを中心として傾き、傾いても素材20の下面の位置は変化せずに研磨することができる。

なお管19は柔軟性を有し弾性体11の多少の傾きは吸収できる。また弾性体11がスプライン軸5に対し摺動するため、ピン14と溝15の係合により押圧板12及び素材20までモータ8による回転が伝わるようにしている。

〔発明が解決しようとする問題点〕

しかし、押圧板12及び素材20の研磨面22のうねりに対する追従性はあまりよくなかつた。この原因の一つはピン14と溝15の間に大きな摩擦力が生じるためである。第3図は、ピン14に作用する力を説明するための説明図で、第2図の主要部の断面図に相当する。第3図の矢印aに示すようにスプライン軸5が回転していれば素材20と研磨面22との摩擦力に見合う力fがピン14により溝15に加えられる。さらに研磨面22のうねりにより素材20と研磨面22との間に第1図に示すように角度が開く状態になつたとし、ピストン6により力Pが与えられるとすると素材20の左端に上向きに力Pが働く。弾性体11の球面の中心Cと素材20の左端までの半径をd、中心Cからピン14までの長さをhとし、中心Cのまわりのモーメントの釣合を考えるとピン14には $\frac{Pd}{h}$ の力も作用する。通常にたつ力Pがかなり大きくなるためピン14にも大きな力が作用し大きな摩擦力が生じていた。

また、第3図においてピン14は溝15により常に左向きに押されることとなり研磨面22のうねりに従つて押圧板12はピン14を中心として振り回わされることとなり、スプライン軸5に対して周期的にピン14の他端へは左右に変位し、押圧板12の回転に変動が生じることとなるという欠点があつた。

本発明の目的は、上記欠点を除去し、被加工物の加工面の研磨盤のうねりに対する追従性がよく、また被加工物の回転変動を少くして円滑に被加工物を研磨することが可能な平面研磨装置の被加工物保持機構を提供することにある。

〔問題点を解決するための手段〕

本発明は、平面研磨装置の研磨盤上の被加工物を保持しこの被加工物の被加工面上の一点を中心とする凸球面を有する保持部34と、保持を一定に保つて設けられ前記被加工物上の一点を中心とし前記凸球面に摺動自在に係合する凹球面を有する支持部32と、前記保持部34と前記支持部32との間に設けられ捩りに対しては剛性が大きく曲げに対しては柔軟な弾性体38とを有するものである。

〔作用〕

ねじりに対しては剛性を有し曲げに対しては柔軟な弾性体38は保持部34を支持部32に対し研磨盤のうねりに追従させてできる摩擦力を生じることなく、傾動させる。その保持部34は支持部32に

円し回転方向にはずれない。

（実施例）

次に本発明の実施例について図面を参照して説明する。第3図は本発明の一実施例の縦断正面である。円盤1、軸2、フレーム3、スリーブ4、エアシリンダ5、レバー7、キー8、歯車9,10は第1図に示すものと同じである。エアライン軸31は、軸方向には摺動自在に軸回りには一体となって回転するようにスリーブ4に取り付けられている。エアライン軸31の下端のフランジ32に取付けた被加工物の回転中心軸33が摺動自在に係合している。中心軸33に押圧盤36が固着されている。押圧盤36の多通孔35は管19と連通され真空吸引を押圧盤36に作用するためのものである。

ベローズ34が上端をフランジ32に固着し下端を押圧盤36に固着して設けられている。ベローズ34は中心軸回りのねじりに対しては剛性が大きいのに対し、中心軸方向の伸縮及び曲げに対しては柔軟であるため、押圧盤36はフランジ32に対し回転方向にはずれないが、しかも自由に傾くことができる。ばつて押圧盤36が傾くときも大きな荷重に生じず押圧盤12及び受台20の研磨面のうねりに対する追従性はよい。

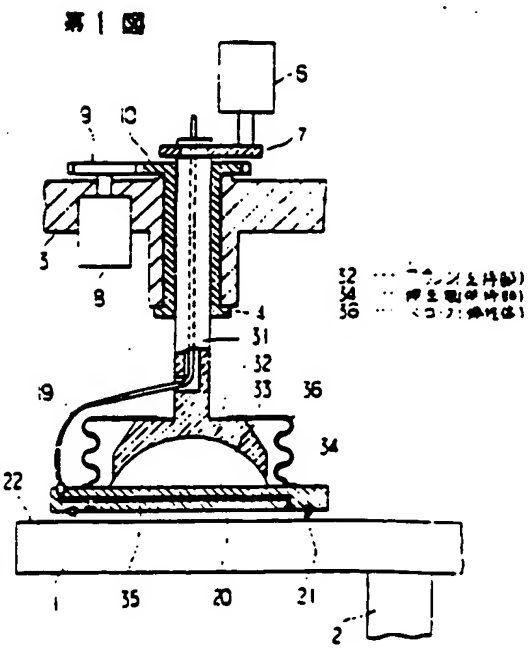
また本発明は、円盤が固定してあつてフレーム3とともに押圧盤36等が軸12を中心として旋回するような平面研磨盤にも適用できる。

また支持部の凹球面と保持部の凸球面の間に潤滑等を介在させて、摩擦力を減少させることもできる。

さらに支持部と保持部との間に設ける弾性体は、必ずしもベローズの形状をしている必要はない。例えばベローズを軸方向に分割したもの、言い換えれば中間を省略された蛇腹の係ねを円周上に並べたものでもよい。

（発明の効果）

本発明の平面研磨盤盤の被加工物保持機構は、以上説明したようにボとピンの係合の代わりにねじりには剛性を有し伸縮及び曲げに対して柔軟性のある弾性体を介在することにより、ボとピンとの間の大きな摩擦力を発生させることなく保持盤



第1図

が傾き、研磨盤のうねりに対する被加工物の傾きの追従性をよくすることができる。

また保持部が傾くときにピンを中心として揺動することがなくなり被加工物の傾斜運動の変動を非常に小さくすることができ、円滑に被加工物を研磨できる効果がある。

4.図面の簡単な説明

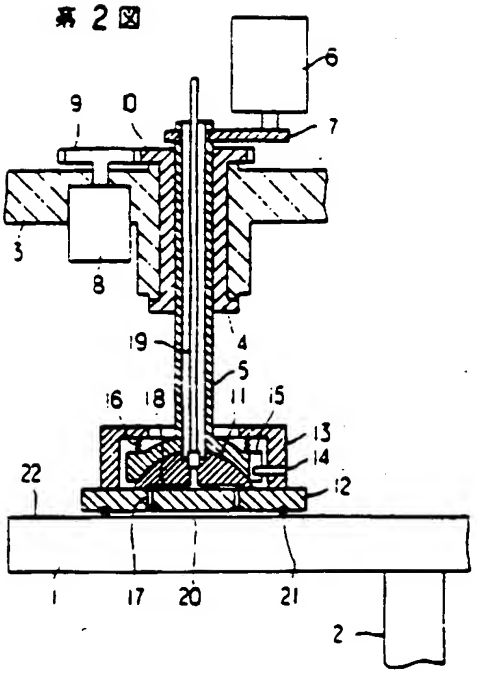
第1図は本発明の一実施例の縦断正面、第2図は平面研磨盤盤の被加工物保持機構の従来の一例の縦断面図、第3図は第2図に示す一例のピン16に作用する力を説明するための模式図である。

1…円盤、3,31…エアライン軸、11,33…中軸、12,36…押圧盤、16…ピン、15…軸、20…受台、34…ベローズ。

特許出願人　日本電気株式会社

代理人　弁理士　菅　野　中

第2図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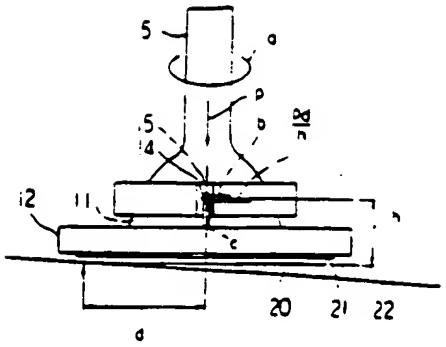
第3図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